

rendering it intermittent by blowing it with a magnet. This method did not answer, as the intermittence was too irregular; and in order to try and overcome this irregularity Mr. Duddell shunted the arc with a condenser, and found that the arc immediately became intermittent without any blowing, and emitted a musical note. It appeared that the leads from the arc to the condenser possessed appreciable self-induction, and that if this were destroyed the musical note ceased. It thus became evident that a direct current arc between *solid* carbons, when shunted by a capacity in series with self-induction, supplied alternating current to the shunt circuit—the complete circuit consisting of the arc, self-induction, and capacity in series, the arc thus acting as a converter of direct into alternating current energy.

This effect can only be produced when the arc has the ratio of a small change in P.D. (∂V) to the corresponding change in current (∂A) *negative*; and when this ratio $\partial V/\partial A$ is numerically greater than r , the resistance of the condenser circuit. This was proved by Mr. Duddell with two experiments. With a cored carbon arc for which $\partial V/\partial A$ is positive he showed it was impossible to obtain a musical note. And using a solid carbon arc shunted by a condenser and self-induction and giving out a clear note, he showed that by increasing the resistance of the condenser circuit the sound steadily diminished and finally completely died out when this resistance became numerically equal to $\partial V/\partial A$. Any cause tending to dissipate the energy in the condenser circuit, such as, for example, the hysteresis of an iron wire core introduced into the self-induction, or any complete circuit, such as a sheet of iron or a closed ring of wire, brought near it, will also stop the note. This phenomenon suggests, as was experimentally demonstrated, a very simple and valuable method of obtaining oscillating currents of any desired frequency for experiments on magnetic space telegraphy.

Some experiments with metal arcs brought out two points of great practical importance. Mr. Duddell found that on shunting an arc between metal electrodes by a condenser the arc went out. The high rise of P.D. caused by thus suddenly breaking an inductive arc circuit may be sufficiently great to break down the insulation of the leads, as was shown by an experiment, in which a weak place in the insulation was introduced by bringing the two conductors to brass plates separated by a sheet of paper: every time the arc was shunted and put out, the paper was pierced by a spark. The same result was obtained by connecting the condenser permanently across the arc terminals and trying to strike the arc. This has important bearing on the practical use of metal switches, since it shows that the arcing at breaking should be encouraged rather than suppressed, since if there be capacity as a shunt to the switch-contacts and self-induction in the main circuit, a high rise in P.D. will occur, and may cause serious damage to the leads. As another instance of the practical application of this effect, Mr. Duddell showed that, when using an induction coil, a far longer spark could be obtained if the connections were made so that the contact maker first broke the circuit and then shunted a condenser across the gap to blow out the spark, instead of, as has always hitherto been done, having the gap permanently shunted by a condenser.

Mr. Duddell concluded his paper by showing that the note emitted by a musical arc could be tuned by adjusting the self-induction and capacity in the shunt circuit. A keyboard was arranged which shunted different capacities and self-inductions across the arc, and by this means two complete octaves were obtainable. Four arcs were arranged in series to increase the loudness of the sound, and a very distinct and not unmusical rendering of "God Save the Queen" was played on them.

The Central Technical College may well be congratulated

on the work on the arc that has been done in its laboratories. Within the last two years there have been four most important papers on this subject read before the Institution of Electrical Engineers—Messrs. Duddell and Marchant's paper on the Alternate-current Arc, Mrs. Ayrton's paper on "Hissing Arcs," her paper at the Paris Congress on the "Light given out by the Direct Current Arc," and the paper by Mr. Duddell above described—all emanating from the College, and each contributing in no small degree to the elucidation of the many very difficult problems which the arc presents.

A BIRD-BOOK FOR YOUNG PEOPLE.¹

WHETHER designedly or no, this attractive little volume is fortunate in the time of its appearance, since it forms an appropriate Christmas gift to young persons of both sexes interested in observing the ways of the birds of their own neighbourhood. And it is not even necessary that such young people should be resident in the country to appreciate the book, for the author, as in his account of the gulls on the Thames in winter, shows that there is much to be learnt with regard to bird-life even by the dweller in the metropolis. The appearance of a bird-book of this nature at the Christmas season is also appropriate in that it tends to draw attention to the severe hardships our feathered friends have frequently to suffer at this time of year, and thus attracts sympathy and attention to their wants.

To those of our readers who are familiar with the Messrs. Kearton by their previous works, no recommendation will be necessary in the case of the volume before us; while to those who have yet to become acquainted with the earlier literary and artistic efforts of these gentlemen, their new production will come as a welcome surprise. For although primarily intended for young people, it must not for a moment be supposed that the author's latest volume is not calculated to interest readers of more mature years. Indeed, the beauty and attractive character of the illustrations (two of which, by the courtesy of the publishers, we are enabled to reproduce) are alone quite sufficient to render the volume acceptable to readers of all classes and all ages. Mr. C. Kearton seems, indeed, almost to have surpassed himself, not only in the execution of the photographs, but in the interesting phases of bird-life and bird-architecture he has portrayed. All the photographs, it appears, have been specially taken for this particular volume, and as they reach one hundred in number, while their *venue* extends from the Thames Embankment to the Hebrides, some idea may be gathered of the amount of time, labour and money expended in its production.

A feature of the book is the attention devoted to nests, eggs and young birds; and although the style is essentially popular and suited to the capacity of the readers for whom it is primarily intended, older ornithologists will scarcely fail to be interested in the chapters on these subjects. In particular we may draw attention to the eight photographs on p. 99, the first of which represents a blackbird's egg on the day previous to hatching, and the other seven the young bird from day to day. By a careful arrangement and adjustment of the camera, the young bird was photographed to the same scale, and the marvellous rapidity of its development—especially between the fourth and seventh day of its existence—will come almost as a revelation to many readers. Unfortunately the further progress of the daily portraiture was brought to an abrupt termination by the unwelcome attentions of a cat. The subject is, however, full of promise, and one worthy to be taken up by other photographers.

¹ "Our Bird Friends: a Book for all Boys and Girls." By R. Kearton. With photographic illustrations by C. Kearton. Pp. xvi + 215. Illustrated. (London: Cassell and Co., Ltd., 1900.)

The precautions adopted for concealing their eggs while birds are temporarily absent from the nest claim a considerable share of the author's attention ; particular interest attaching to the description and illustration of

when a child, he was delighted by bird-stories told by his grandfather. "They," he adds, "will enjoy a great advantage over me in being able, through the achievements of my brother's camera, to examine accurate pictures of the birds living, loving and labouring amidst their natural surroundings." No words of ours can add aught to this modest description of the most attractive feature of a charming book.

R. L.



FIG. 1.—Eggs of the Ringed Plover. From Mr. Kearton's "Our Bird Friend."

the manner in which moorhens are in the habit of bending down some of the adjacent reeds in order to prevent the eggs from being seen from above. Not less attractive are the illustrations showing the contrast in the appearance of the nest of the eider-duck when just vacated by the parent bird and when the eggs are enveloped in a mantle of fleecy down. Other illustrations display the adaptation of the eggs of the plover tribe to their environment, as well as the economy in space obtained by the clutch of four being placed with their narrow ends pointing inwards, both these features being admirably displayed in the annexed photograph of a ringed plover's nest. While on the subject of eggs it may be mentioned that some confusion is, we think, likely to occur in identifying which is the raven's and which the curlew's egg in the photograph on p. 80. And it may be added that, on the same page, *Epyornis* is not the way to spell the scientific name of the extinct Malagasy roc, which is compounded from the Greek *αἶψα*.

Another subject to which the author directs the attention of his readers is the connection between the structure and form of feathers and the uses they are intended to subserve ; and here, again, the illustrations admirably assist in the interpretation of the letterpress. After describing the manner in which a gannet dashes into the water in its headlong descent when in pursuit of prey, Mr. Kearton proceeds to observe that "the shock produced by such a heavy bird suddenly striking the surface of the ocean after descending from a considerable height at great velocity would kill some species of smaller size on the spot. But the gannet has been properly equipped for its task. The shafts and vanes of its breast feathers have been tremendously thickened, and their quills are buried in a quarter-inch-thick pad of very close-set down, which acts like a buffer when its wearer strikes the surface of the sea."

Contrasted with this are the "fluffy" and loosely-attached feathers on the breast of the heron, which fishes while standing, and therefore needs no breast-plate.

In his preface the author tells his young readers how,

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HUXLEY MEMORIAL.

WE have received a copy of the final report of the Huxley Memorial Committee, which announces the completion of their task, and is accompanied by a full donation list, signed on behalf of the committee by the Hon. Treasurer and Secretary. It shows the cost of the statue to have been 1814*l.* ; of the dies for the medal 264*l.*, inclusive of all that pertained to each ; and this, with the sum of 201*l.* for total working expenses, and the balance of 1126*l.*, paid to the Board of Education as an endowment for the medal at the Royal College of Science, brings the total amount received and expended to a little over 3450*l.*, as compared with the Owen Memorial, which realised 1100*l.*, the Darwin rather more than 5000*l.*, and the Jowett about 10,000*l.*

The statue we have already described (NATURE, vol. lxii. p. 12), and of the medal for the Royal College of Science and the arrangement for the production of a memorial medal at the Anthropological Institute, to which we alluded at the same time, the report contains nothing that is new. It concludes with the thanks of the committee to the Hon. J. Collier for the gift of a portrait of the late Prof. Huxley to the National Portrait Gallery, in lieu of their inability to provide one.

The number of persons of distinction of all nationalities who ultimately consented to join the "General

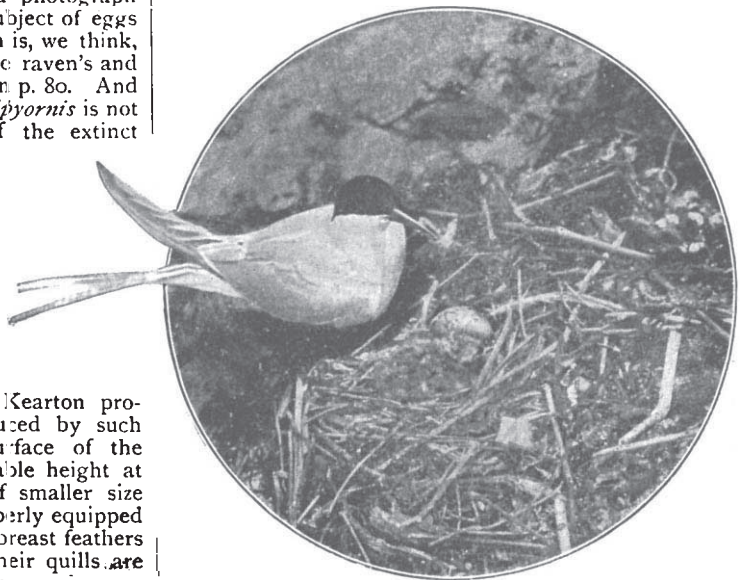


FIG. 2.—Arctic Tern guarding her nest. (From Mr. Kearton's "Our Bird Friends.")

Committee" was close upon 750, and of these one-third were foreigners, 33 colonials. All but 60 of them subscribed, and the total number of contributors was